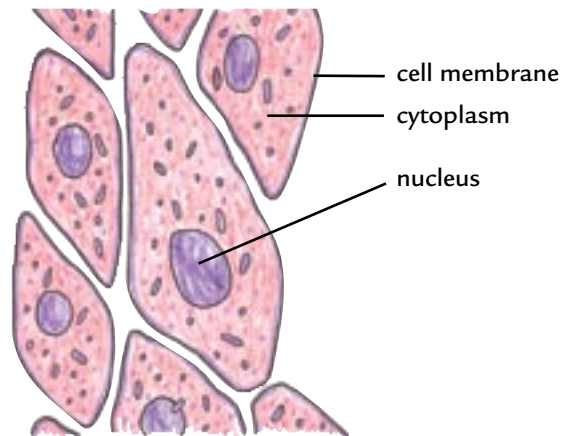
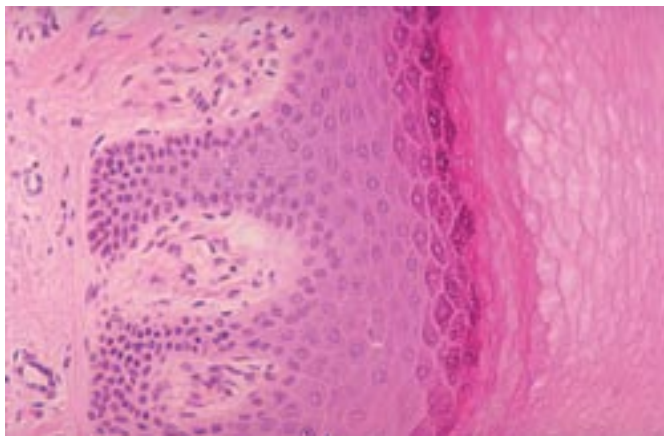


# 42 A Closer Look

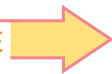


**Y**ou learned that Schleiden and Schwann discovered that all living organisms are made up of one or more cells. This includes plants, animals, and many microbes. The microbes that cause infectious disease are often organisms made up of just one cell, as Siebold discovered. Most organisms you can see without a microscope are made of many cells.

The cells shown here are from human skin. What do you see inside the cells? What exactly are you looking at when you use a microscope to look at a cell?



## CHALLENGE



What are some of the parts of a cell? What do they do?

### MATERIALS



*For each group of four students*  
**colored pencils**



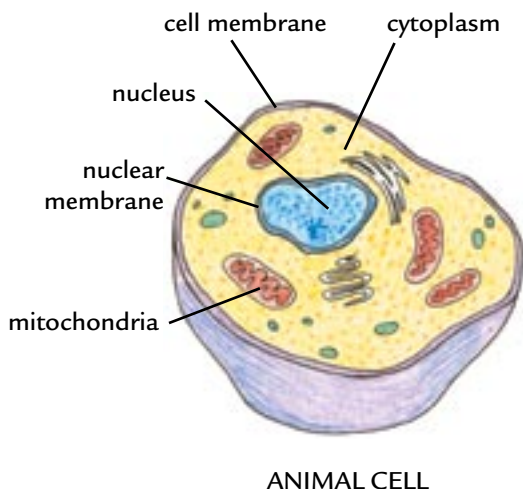
*For each student*

- 1 Student Sheet 42.1, "KWL: The Wonderful World of Cells"
- 1 Student Sheet 42.2, "Inside a Cell"

## READING

Use Student Sheet 42.1, “KWL: The Wonderful World of Cells,” to guide you as you complete the following reading.

### A Typical Cell



As scientists continued to study cells, they noticed structures inside the cells. From observing many kinds of cells in thousands of organisms, biologists discovered that some structures are found in all or nearly all cells. These structures are so common that they are usually included in models or drawings of a “typical cell.”

The most common structure of cells is the cell membrane (see figure at left). This membrane separates the cell from its environment. Every kind of cell, whether a bacterium, or a cell from an elephant or from a giant oak tree, has a cell membrane. As you learned in Activity 40, “A Cell Model,” the cell membrane acts as a barrier to control what enters or leaves the cell. Somehow, everything that enters or leaves the cell must cross this membrane.

The material enclosed by the cell membrane is called the cytoplasm, which means the “cell material.” In the cytoplasm the cell breaks down nutrients from food and builds the new substances it needs to grow and to carry out its other functions.

### STOPPING TO THINK 1

- How did scientists discover the common structure of cells?
- What are some of the common structures of a cell?

In 1831, Robert Brown identified a small dark center within many cells. He called this center the **nucleus**. You were probably able to observe the nucleus in onion, *Amoeba*, and human cells. Most organisms—except for bacteria—have a cell nucleus. The nucleus is a small compartment within the cell. It is separated from the rest of the cell by a nuclear membrane. The nucleus contains the majority of the genetic information of the cell and directs the cell’s activities, including growth and reproduction.

## STOPPING TO THINK 2

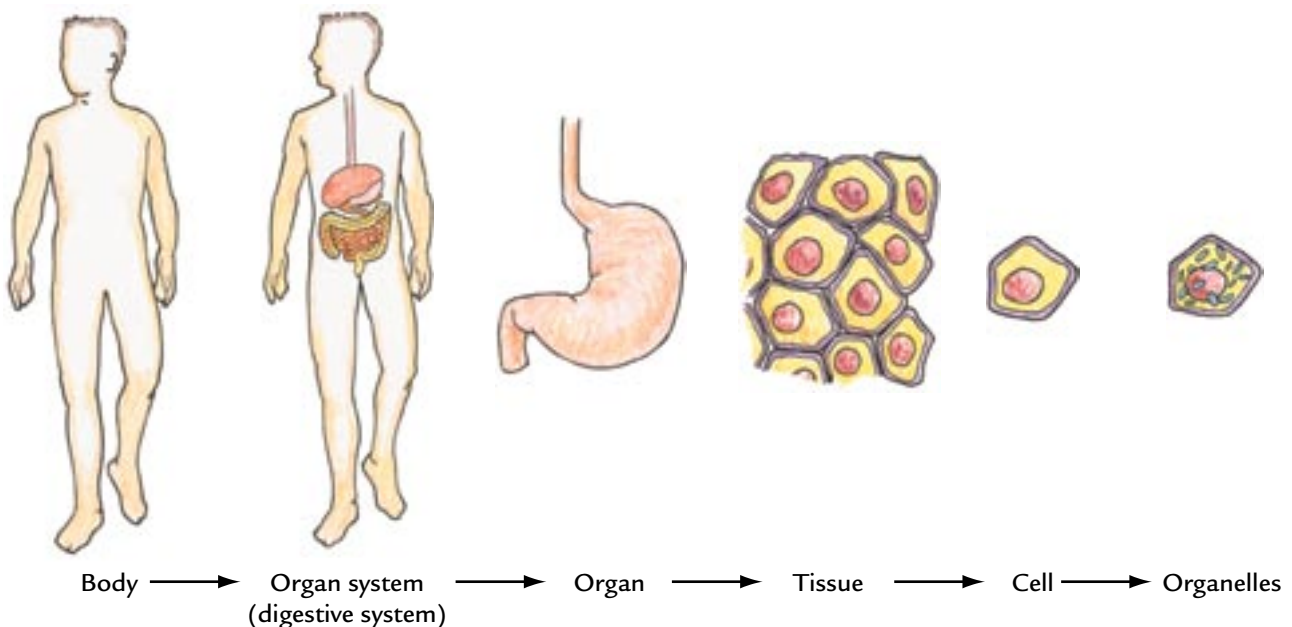
- Why is the nucleus an important part of most cells?
- What type of organism does not contain a nucleus?

Most cells have other tiny structures that help them do many jobs. These structures are called **organelles**, or “little organs.” They are often surrounded by their own special membranes. Some of the organelles can just barely be seen with a light microscope. Some of the jobs performed by these organelles include obtaining and storing energy, helping cells move and divide, and making substances that are either used in the cell or transported to other parts of the body.

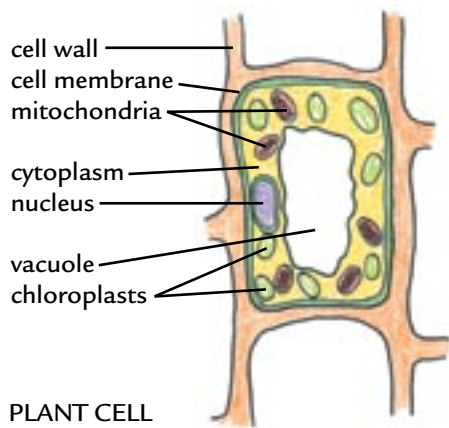
The organelles that produce energy are called mitochondria (my-toe-KON-dree-ah) (singular mitochondrion). Mitochondria use oxygen and nutrients to produce most of the energy that a cell needs. For this reason they are sometimes called the cell’s power plant. Different types of cells have different numbers of mitochondria, ranging from one to thousands. Cells that need a lot of energy, such as heart cells and muscle cells, have more mitochondria than cells with low energy requirements. Mitochondria are usually rod-shaped, but in some cells they can be round.

## STOPPING TO THINK 3

- What are some of the functions of organelles?
- What do mitochondria use to produce energy for a cell?



## Activity 42 • A Closer Look



PLANT CELL

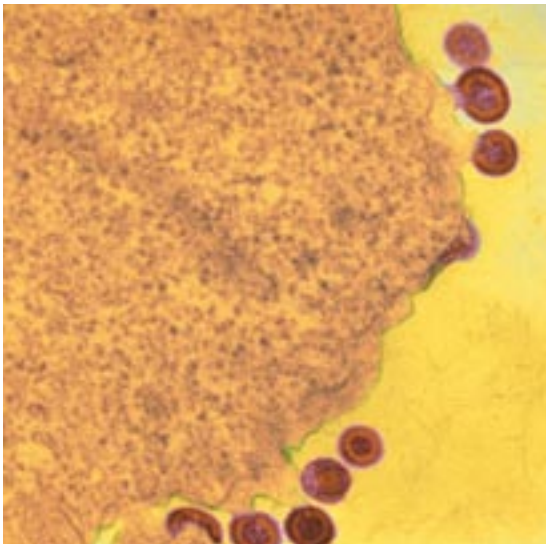
A plant cell's structure is a little different than an animal cell's structure. In addition to the cell membrane, it has a cell wall. The cell wall provides additional support and stability to a plant cell. Green plants also have organelles called chloroplasts (KLOR-oh-plasts). Chloroplasts absorb light and use it along with water and carbon dioxide to produce sugars for the cell. The cell uses the sugars as nutrients. This whole process is called photosynthesis. There are some protists, such as algae, that also have chloroplasts and photosynthesize. Plant cells, like animal cells, have mitochondria that use oxygen and nutrients to produce energy.

### STOPPING TO THINK 4

- Why do plant cells have a cell wall in addition to a cell membrane?
- What do chloroplasts use to produce nutrients for plant cells and some protist cells?

### What Can You Learn from Studying Cells?

Information about cells can be used for practical purposes, such as treating different kinds of diseases. Here are just two examples:



*A cell biologist used an electron microscope to take this photo of HIV (the virus that causes AIDS) on the surface of a human white blood cell.*

- AIDS is a disease of one group of cells within the human body. Investigating how these cells work normally and what goes wrong in the cells of a person with AIDS helps scientists understand the disease and develop treatments.
- Human blood contains red blood cells. Each red blood cell lives in the human bloodstream for only about 120 days. New red blood cells are constantly being formed as old ones die. Researchers have used information about how new red blood cells develop to prepare a drug that causes more red blood cells to form. This drug is given to patients who require certain kinds of surgery or to people with illnesses that reduce the number of red cells in the blood. The drug helps patients build up red cells and require fewer blood transfusions.

## Cell Biology

Cell biology is the special branch of biology that studies cells and how they work. Cell biologists are fascinated by the variety of cells and the fantastic structures inside them. Some cell biologists study one type of cell, such as muscle cells. Others focus on special parts of cells, such as cell membranes, to understand how they work. Some of the questions that cell biologists try to answer are:

- How do the different cells in an organism work?
- What does each part of the cell do, and how?
- How do the different cells in an organism communicate and control their activities so that things happen in the right place and at the right time?
- How can one fertilized human egg cell grow into a complex adult with many kinds of cells?
- How does a cell know when to divide?

Scientists have found some exciting partial answers to these questions, but there is a great deal left to learn about cells.



*A cell biologist using an electron microscope*



## ANALYSIS

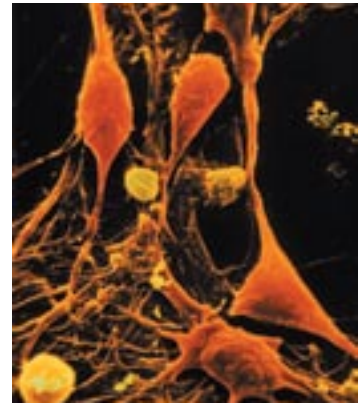


1. Observe the pictures of animal cells shown below. Cells 1, 2, and 4 were taken with a scanning electron microscope which shows the surface (and not the inside) of the cell. This type of microscope magnifies the cells much more than the microscopes you use in class. You can see that the cells have quite different shapes: some are rounded, while others are elongated, flat, or ruffled. These shapes depend on the cells' functions in the body. Try to match each cell with one of the following descriptions.
  - a. These cells have long branching parts that send signals to distant parts of the body.
  - b. These flat cells form an even covering on the surface of areas like the inside of the mouth.
  - c. These round human cells are unusual because they do not have a nucleus. They are full of a protein that carries oxygen to all parts of the body.
  - d. These cells are able to crawl around the body to attack bacteria and other foreign material. Ruffles on the cell membrane lead the way as the cells move.

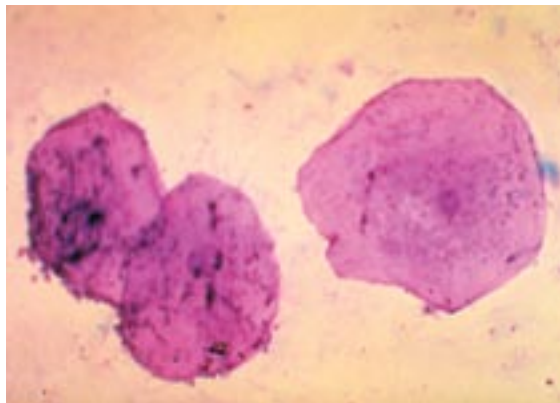
### ANIMAL CELLS



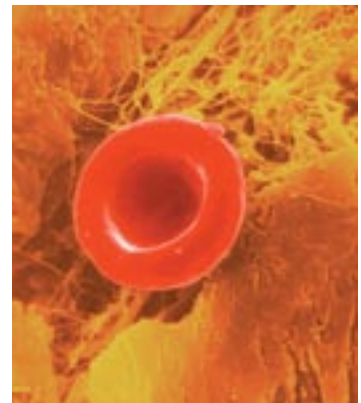
1



2



3



4



2. Based on its description, which of the four cells described in Question 1 is a nerve cell? Which is a red blood cell? Which is a white blood cell? Which is a skin cell? Explain how you were able to match the type of cell with its function.



3. Complete the third column of Student Sheet 42.1, “KWL: The Wonderful World of Cells.” Discuss your answers with your group of four.



4. Imagine the cell is a factory. List the parts of a factory that the following parts of the cell correspond to because of similar functions.

Parts of a Cell		Parts of a Factory
Cell membrane		
Cytoplasm		
Nucleus		
Nuclear membrane		
Mitochondria		

5. Explain why membranes are so important to cells.

6. Look back at your drawings from Activity 36, “Looking for Signs of Micro-Life.” Did you observe any structures within the microbes that you drew? What do you think these structures are?

7. Explain how the study of cells helps treat disease.

8. **Reflection:** Which of the questions studied by cell biologists is most interesting to you? Why?



## EXTENSION

For links to photographs and more information about cells, go to the *Issues and Life Science* page of the SEPUP website.